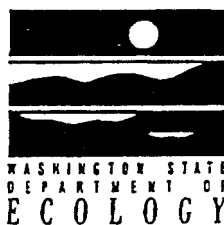




ISLAND COUNTY  
GROUND WATER  
MANAGEMENT PROGRAM

Funded in part by Washington Department of Ecology's Centennial Clean Water Fund  
February 1992



# ISLAND COUNTY GROUND WATER MANAGEMENT PROGRAM

## SUPPLEMENT

On October 7, 1991, the Island County Board of Commissioners adopted the Island County Ground Water Management Program (GWMP) as an element of the Comprehensive Plan.

On February 19, 1992, the Washington Department of Ecology certified the Island County Ground Water Management Program. Per WAC 173-100, Ecology was required to consider the recommendations of the Ground Water Advisory Committee (GWAC) in the review and certification of the Program. Because the GWAC recommended certain changes to the document as adopted by the Board of Island County Commissioners, the Program as certified by Ecology differs slightly from the Program as adopted by the Board of Island County Commissioners. This supplement describes these differences and serves to avoid the wasted expense of producing two versions for distribution.

The text in the body of this document is that certified by Ecology. Following are the line-by-line differences that distinguish the document adopted into the Island County Comprehensive Plan from that certified by Ecology.

<u>Page</u>	<u>Island County Comprehensive Plan version</u>
VI-54, paragraph labeled "Personnel:"	Last sentence deleted.
VI-86, "Recommended Strategy:"	Revised to read: "Strategy 1 is recommended for implementation. Designating the Focus Areas as Environmentall Sensitive Areas is defensible and viable ground water management option. Such designation, accompanied with the appropriate elimination of exemptions, will provide significant protection to Island County ground water resources. The Environmentally Sensitive Areas should be refined or expanded as additional ground water information is gathered."
VI-102, fourth bullet	The phrase "water level monitoring" deleted.
VI-108 to VI-112	Section F deleted.

ISLAND COUNTY  
GROUND WATER MANAGEMENT PROGRAM

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## GLOSSARY OF ACRONYMS

AFY	Acre-feet per year
APA	Aquifer Protection Area (RCW 36.36)
BICC	Board of Island County Commissioners
CWSP	Coordinated Water System Plan (Chapters 70.116 and 90.54 RCW)
Ecology, DOE	Washington State Department of Ecology
DCAP	GWMP Data Collection and Analysis Plan
DCMP	Data Collection and Management Program
DMP	Data Management Plan
DOH	Washington State Department of Health
EPA	Environmental Protection Agency
gpd	Gallons per day
gpm	Gallons per minute
GMA	Growth Management Act (SHB 2929)
GWMA	Ground Water Management Area
GWMP	Ground Water Management Program
GWAC	Ground Water Advisory Committee
ICC	Island County Code
LAWS	Local Association of Water Systems
MCL	Maximum Contaminant Level
MGD	Million gallons per day
ICED	Island County Engineering Department
ICHD	Island County Health Department
ICPD	Island County Planning Department
ICPW	Island County Public Works
Department	
OFM	Office of Financial Management
ppm	Parts per million
RCW	Revised code of Washington
RWA	Regional Water Associations
SSMA	Satellite System Management Agency
SCS	Soil Conservation Service
SEPA	Washington State Environmental Policy Act
WAC	Washington Administration Code
WHP	Wellhead Protection
WSU	Washington State University
USDA	United States Department of Agriculture

ISLAND COUNTY  
GROUND WATER MANAGEMENT PROGRAM  
EXECUTIVE SUMMARY

This executive summary provides a concise overview of the recommended strategies for ground water management in Island County. The summary is intended to state the reasons why the Ground Water Management Program was undertaken, how it was developed, and its philosophy and goals. Elements of the preferred program, funding sources, environmental impacts, and program certification are outlined.

**A. BACKGROUND**

Island County is located within the Puget Sound lowland, between the Cascade Range and the Olympic Mountains and north of Seattle. The County includes Whidbey and Camano Islands in addition to several smaller islands. Together Whidbey and Camano Islands comprise approximately 210 square miles.

With the exception of the City of Oak Harbor and the Naval Air Station Whidbey Island, ground water is the primary source of drinking water in the County. Existing evidence does not indicate the presence of underground water sources emanating from the Cascade or Olympic mountains. For these reasons, ground water in Island County is obtained from sole source aquifers with a finite water supply.

Numerous cooperative water resource investigations in Island County involving the United States Geological Society, Department of Ecology, Department of Health, and Island County Health and Planning Departments indicate the need to manage the resource to adequately protect ground water from adverse affects resulting from increased withdrawals and land use.

In response to the results of water resource investigations indicating the potential for ground water shortages and quality problems and pursuant to the existence of a finite ground water supply in Island County, Ecology declared Island County to be a Ground Water Management Area (GWMA) under the authority of WAC 173-100. The designation of Island County as a GWMA initiated the development of a Ground Water Management Program (GWMP).



## B. PROGRAM DEVELOPMENT PROCESS

The development of the Island County Ground Water Management Program began with the formation of a Ground Water Advisory Committee (GWAC). The GWAC represents a broad spectrum of interests including representatives from the state, county, and local government agencies; water systems; development interests; citizen organizations; and the general public.

The Island County Planning Department was granted the lead agency role with the responsibility for undertaking activities necessary for Ground Water Management Program development.

The early stages of GWMP development involved GWAC evaluation of existing local and state programs pertaining to water resources. Areas where deficiencies existed were identified and strategies to rectify those deficiencies were developed and evaluated. Recommended strategies constitute the preferred program. Ongoing options are subject to continued review for possible incorporation into the preferred program at a later date.

## C. PROGRAM PHILOSOPHY

The Island County Ground Water Advisory Committee, in its approach to the development of a Ground Water Management Program, recognizes the finite nature of Island County's groundwater resource and the increasing pressure, through growing population, on this resource.

The philosophy of the Ground Water Advisory Committee is consistent with Comprehensive Plan policy of living within the capacity of the natural resources of the County.

The Comprehensive Plan recommends that Island County should:

- o "Encourage managed and balanced utilization of all natural resources" (page II-10),
- o "Protect, maintain and enhance the quality and quantity of Island County's water resources for recreation, fish, wildlife, and domestic utilization" (II-15),

More specific policy elements of the Comprehensive Plan state that:

- o "Environmental and land use policies should be consistent with the need for proper water resource management" (II-15),

- o "The capability of air, land, and water resources to support development should be a determining factor in making land use decisions" (II-5),
- o "The location and design of urban development should be carefully guided in order to minimize potential adverse impacts on the quality of ground and surface waters." (II-6), and,
- o "Areas with limited ground water quality or quantity should be restricted to low density unless adequate domestic supplies are available" (II-6).

These policy elements comprise a framework upon which the policies of the Ground Water Management Program can be constructed.

#### D. PROGRAM GOAL

The goal of the Island County Ground Water Management Program is to protect and enhance the quality, quantity, and recharge of ground water supplies in Island County.

#### E. PROGRAM OBJECTIVES

The following objectives are necessarily broad in scope. Specific policy elements to be implemented as part of the GWMP can be identified only after sufficient research and evaluation of management options has taken place, and no attempt to present these specific options is made in this section.

Preventative management of ground water is ultimately more effective and efficient than restorative or remedial measures. The objectives of the Island County GWMP are generally oriented towards prevention of ground water problems; however, it is recognized that current and future problems will require remediation.

Objectives of the Island County GWMP are:

##### EDUCATION

- o Educate the public and ground water managers about the characteristics of ground water resources and about confirmed and potential impacts on the resource.

##### CONSERVATION

- o Establish a water use efficiency program, coordinated with the Island County Coordinated Water System Plan and

the Comprehensive Plan, to help:

- A. reduce existing usage,
- B. maintain current ground water levels,
- C. alleviate salt water intrusion problems,
- D. ensure sustained supplies of ground water are available for Island County residents, and
- E. optimize the efficiency of future ground water usage.

#### MONITORING

- o Through data collection and analysis programs, increase knowledge of the limitations and characteristics of the County's groundwater resource. To provide useful information, such ground water monitoring must recognize regional, seasonal, tidal, and other variables which affect ground water characteristics throughout the County. An ongoing ground water monitoring program will help to:
  - A. determine the extent of any seasonal and long-term trends in seawater intrusion;
  - B. determine the extent of any seasonal and long-term trends in water level changes;
  - C. refine estimates of rainfall, runoff, and recharge;
  - D. refine County-wide ground water usage estimates; and
  - E. identify any areas in which agricultural activities, domestic activities, hazardous waste disposal, chemical use, industrial/commercial activities, landfills or other land uses which have or may cause groundwater contamination.
- o Maximize the accumulation and use of information from new and existing wells.

#### REGULATION

- o Develop land use approval criteria based on ground water quantity, quality, recharge, the vulnerability of the resource, and risks associated with proposed land uses.
- o Prevent contamination of ground water through control of potentially contaminating activities or land uses.
- o Evaluate the effectiveness of existing County codes in protecting ground water and recommend changes, or the creation of new codes, where appropriate.
- o Explore other regulatory avenues in ground water

protection which are reasonable and effective.

#### COORDINATION

- o Define the responsibilities and capabilities of all local, state, and federal agencies in the long-term management of groundwater in Island County.
- o Ensure that planning efforts in the County which may impact ground water are coordinated with the Ground Water Management Program.
- o Ensure that Island County ground water issues are considered in State efforts to develop new water resource policies and regulations.

#### F. ISLAND COUNTY GROUND WATER POLICY

It shall be the policy of Island County that all proposed actions be consistent with the goals and objectives of the Ground Water Management Program. The following statements will implement elements of these goals and objectives, and the recommendations of the Ground Water Advisory Committee.

Water Rights: Any action which involves or leads to a change in ground water usage, including distribution, should be accompanied by appropriate changes to water rights. These actions include, but are not limited to, water system expansion, annexations by water districts or municipalities, and water system planning. Water rights no longer in use may be relinquished under the authority of Ecology.

Water Use Efficiency: Inefficient use of Island County water resources shall be inconsistent with this policy. Any proposed actions leading to or involving uses of Island County water resources should be evaluated in terms of water use efficiency, and approval withheld until a finding is made that reasonable efforts have been made and appropriate technologies used to ensure that water use practices will be consistent with the goals of the Ground Water Management Program.

Ground Water Recharge: Recharge of ground water is the preferred method of surface water disposal from a site, except where such recharge could contaminate ground water or otherwise cause adverse environmental impacts, such as depletion of downstream flows. Any action which involves the

creation of impervious surfaces should be carefully evaluated in terms of the effect on recharge. Where appropriate and as necessary, total impervious surface should be limited to protect recharge.

Contamination of Ground Water: Any proposed action should be evaluated in terms of potential for ground water contamination, and approval withheld until a finding is made that appropriate measures have been taken to avoid such contamination. Such contamination shall include, but not be limited to, seawater intrusion and the introduction of harmful chemicals or other substances, by any means, into the ground water. Existing policies and regulations, such as SEPA, should be used as appropriate to address contamination concerns. Any remedial measures to correct ground water contamination resulting from past actions should be consistent with the GWMP.

Well Abandonment: Any action leading to or involving the abandonment or discontinued use of any water well should not be approved until assurances are made that all such abandoned wells will be located and identified and that such abandonment will follow appropriate procedures as provided for in State law.

Well Identification: Any proposed action which involves the preparation or exchange of information on real properties should not be granted final approval until the location and status (active or abandoned) of any wells, along with status of any water rights associated with such wells, are properly identified and documented.

Ground Water Withdrawals: Any proposed action which involves or leads to withdrawals of ground water should not be granted final approval until reasonable assurances are made that such withdrawals will not adversely impact existing ground water uses.

Watershed Protection: Island County should work closely with municipalities and large water systems to provide comprehensive protection of the water resources serving these systems, especially where such protection is needed on lands outside the jurisdiction of these systems. This should include joint protection of watersheds, wellhead protection, and other efforts where cooperative

action would most effectively provide the necessary protection.

Coordination with State Agencies: State and federal agencies, including the Department of Ecology, the Department of Health, the Department of Natural Resources, the Department of Fisheries, the Federal Emergency Management Agency, and other applicable agencies, when exercising their authority in Island County, should make every effort to ensure that the policies of the Ground Water Management Program are not contradicted. Furthermore, these affected jurisdictions should review their applicable policies and regulations and consider amendments, as appropriate, to ensure consistency with the goals and objectives of the GWMP.

#### G. ELEMENTS OF THE PREFERRED PROGRAM

The GWAC has recommended fourteen management strategies that constitute the Island County Ground Water Management Program. These strategies are recommended for implementation in Island County by the GWAC. It is further recommended that affected local agencies, such as incorporated areas, support these recommendations (see Section VI). The following recommendations comprise the preferred program for comprehensive ground water management in Island County:

1. Implement a comprehensive Education Program in Island County to elevate awareness of water resource issues.
2. Implement a Technical Assistance Program in Island County to assist and provide technical support to water system managers, private well owners, and any other citizens at large requesting assistance.
3. Implement a County-wide Conservation Program to encourage efficient use of ground water.
4. Implement a long-term Data Collection and Management Program to allow for early detection of unfavorable trends in either ground water quality or quantity and to refine existing ground water recharge estimates.
5. Implement a Ground Water Development Classification Matrix to provide an objective and technically sound basis for permitting withdrawals in Island County and to protect existing and potential users from adverse affects to ground water quality or quantity.
6. Revise Island County's water resource ordinance,

Potable Water Source and Supply, ICC 8.09, to strengthen its testing requirements for ensuring adequate water supply.

7. Revise Island County Land Development Standards (Chapter 11.01 ICC) to require consideration of recharge as an alternative to directing water offsite.
8. Designate Island County an Environmentally Sensitive Area pursuant to SEPA to provide for environmental review of certain activities which could have adverse effects on ground water quality and quantity.
9. Designate Island County as a critical aquifer recharge area pursuant to the Growth Management Act (SHB 2929), develop criteria to estimate aquifer susceptibility, and implement regulations to preclude land uses incompatible with these areas. These activities are currently underway.
10. Designate Areas of Special Concern pursuant to WAC 248-96 On-Site Sewage Systems. The legislative change to WAC 248-96 is in draft form; the designation will occur following finalization of the draft.
11. Consider levying the conservation futures tax, pursuant to RCW 84.34, to provide funds to purchase or otherwise protect lands important to water resources protection in Island County.
12. Develop specific performance standards for land uses which potentially threaten ground water quality. Promote safe agricultural and waste disposal practices to prevent ground water contamination.
13. Implement a coordination program in Island County to promote effective communication with local, state, and federal agencies regarding water resources management.
14. Continue implementation of the Memorandum of Understanding between the Department of Ecology and Island County.

After the certification of the GWMP by Ecology, the GWAC will continue to evaluate several vital options concerning ground water protection in Island County. These options have been deferred due to economic, political or technical reasons, or simply due to incomplete legislative guidance at the time the

plan was completed. These options include:

1. Effectiveness and impacts of the State Building Code Amendments.
2. Development of guidelines for the construction of artificial recharge facilities.
3. Feasibility of designating a Water Resource Overlay zone.
4. Feasibility of designating Special Protection Areas (WAC 173-200).
5. Advisability of sponsoring an election ballot issue asking voters to designate Island County an Aquifer Protection Area.
6. Feasibility of establishing a Wellhead Protection Program.

#### H. FUNDING

Potential sources of funding for the Ground Water Management Program are identified in the Preferred Program and Implementation Plan. The Centennial Clean Water Fund (CCWF) is identified as the most appropriate source of short-term funding for GWMP implementation. Because of the CCWF application and funding schedule, interim funding will be required to initiate implementation of the GWMP. It is recognized that an alternate funding source is necessary to provide support for ongoing implementation of the GWMP.

#### I. ENVIRONMENTAL REVIEW

The Ground Water Management Program is subject to review pursuant to the State Environmental Policy Act (SEPA). Evaluation of potential adverse environmental impacts was an integral part of the selection of the preferred management strategies and was conducted for each management option.

A threshold determination will be made following public review of this document.

#### J. PROGRAM CERTIFICATION

According to WAC 173-100, once the GWMP has been completed and approved by the GWAC, it will be submitted to Ecology for certification. During the certification process, all affected local governments will be asked to express their concurrence or non-concurrence with the elements of the



preferred program. If an affected government does not concur with a portion of the program, they will notify the lead agency in writing and tell the lead agency of desired changes necessary to achieve concurrence. The GWAC will be involved in the review of these comments.

Once the GWMP is certified by Ecology, state agencies and affected local governments must adopt or amend existing policies, regulations, ordinances, and/or programs to be consistent with the elements of the preferred program.

## SECTION I

### INTRODUCTION

The development of the Ground Water Management Plan has been the result of cooperative efforts of County agencies and dedicated members of the Ground Water Advisory Committee (GWAC). This section introduces the events which led to the formulation of the plan, the plan development process, and acknowledges plan contributors.

#### A. BACKGROUND

Increased ground water withdrawals associated with population growth have caused concern about ground water availability and seawater intrusion. Over the past 15 years, Island County has increased its efforts to better define and manage ground water resources.

In late 1979, the United States Geological Survey (USGS), in cooperation with the Island County Board of Commissioners and Washington State Department of Ecology (Ecology), began a comprehensive study of ground water resources in Island County. The study, Ground Water Resources and Simulation of Flow in Aquifers Containing Freshwater and Seawater, generated valuable information regarding the hydrogeologic setting of the islands, chemical quality of ground water, and ground water flow. The effects of increased ground water withdrawals on water levels and chloride concentrations were examined and areas with existing seawater intrusion problems were identified. The study indicated that seawater intrusion could increase in magnitude and become more widespread with additional ground water development. Additional data collection and monitoring was recommended to better manage the resource.

In the early 1980's, a preliminary survey of ground water resources in Island County conducted by the USGS, prepared in cooperation with the Island County and Ecology, indicated the increased potential for seawater intrusion with increased withdrawals associated with population growth. Sampling of chloride concentrations in July 1978, April 1980, and August 1980 indicated three problem areas, including northeastern and southern Camano Island and Central Whidbey Island.

The County Board of Commissioners petitioned the Environmental Protection Agency (EPA) in April 1981 to designate the aquifers underlying Whidbey and Camano Island as the sole or principal source of drinking water for the area. This petition was based on the aquifers' vulnerability

to contamination from industrial sources, subsurface sewage disposal, and seawater intrusion. Island County was designated a sole source aquifer by EPA in April 1982. The designation requires any federally funded project to be designed to ensure that it will not cause ground water contamination.

In July 1989, the Island County Sea Water Intrusion Policy was signed by the Island County Health Department and the State Department of Health. This policy established an important framework designed to regulate public water systems threatened by seawater intrusion, as indicated by chlorides and conductivity. This policy has set a precedent for the development of a State-wide seawater intrusion policy.

In July 1990, the Island County Coordinated Water System Plan (CWSP) was adopted by resolution of the Island County Board of Commissioners. The process was initiated in 1985 following the declaration that Island County as a critical water supply service area. This plan provides administrative procedures and a regional strategy for management and development of public water supplies.

The CWSP was prepared pursuant to the Public Water System Coordination Act (RCW 70.116) enacted by the Washington State Legislature in 1977. To achieve organized development of water utilities, to limit the proliferation of small, inadequate or poorly managed water systems, and to integrate water system development with land use planning, the County evaluated all aspects of water distribution to develop the CWSP. In evaluating various water resource management alternatives, the CWSP discussed 1) the reservation of water rights pursuant to WAC 173-590, and 2) the importation of off-island water to serve both Whidbey and Camano Islands. Neither alternative was recommended. The CWSP recommends that future growth be planned in an orderly fashion within the capacity of the islands to support that growth. The reservation of future water supply is not recommended in the CWSP as a viable management option to alleviate the ground water problems identified (CWSP, VI-24).

Following the philosophy of the Comprehensive Plan, the GWMP does not consider reservation or importation of off-island water supplies as viable ground water management strategies. Because the GWMP will be adopted as an element of the Comprehensive Plan, serious future consideration of these alternatives will require amendments both to the CWSP and to the Comprehensive Plan, and will also require complete environmental review pursuant to SEPA.

Although the CWSP and GWMP are inherently overlapping

documents, their purposes are distinct. The CWSP is designed to provide future direction and guidance for future planning, management, and operation of water systems, whereas the GWMP is designed to protect, preserve and enhance ground water quality, quantity, and recharge.

#### B. PROJECT AUTHORIZATION

The Ground Water Management Plan process was initiated under the Ground Water Management Act of 1985 to establish simultaneous and comprehensive planning policies related to ground water resources. In 1986, Ecology designated Island County a Ground Water Management Area under the authority of WAC 173-100 and a grant to develop a Ground Water Management Plan was obtained from Ecology under a 1987 contract.

#### C. GROUND WATER MANAGEMENT PROGRAM DEVELOPMENT

One of the first activities of the program was the selection of an Island County Ground Water Advisory Committee (GWAC) to oversee in the development of Island County Ground Water Management Plan and to assure its development is both technically and functionally sound. Membership on the GWAC is from a broad spectrum of interests, including representation from state, county and local agencies, water systems, community organizations, and citizens at large. Current Committee members and sectors of representation are listed at the beginning of this document.

The Island County Planning Department was established as the lead agency with the responsibility for coordinating activities necessary for the development of the Ground Water Management Program. These activities include delegating activities to the GWAC and coordinating SEPA review.

The County retained Economic and Engineering Services, Inc. of Olympia in 1987 to conduct Part A of the Island County contract with Ecology. Part A efforts included gathering technical information, reviewing applicable policies, laws and ordinances, and starting a public information program. These activities were carried out by the Technical, Policy and Public Involvement subcommittees of the GWAC. Specific tasks related to hydrogeologic characterization were subsequently sub-contracted to Hart Crowser and Associates, Inc. and Pacific Groundwater Group, Inc., both of Seattle. Funding for Part A of the contract was provided by a grant from Ecology and the Centennial Clean Water Fund, which was matched by funding from Island County, including volunteer contributions.

Part A of the contract was completed at the end of 1989. It

was decided to concentrate and accelerate efforts of the GWAC to complete Part B tasks, namely the development of the Ground Water Management Program. Development of the program was accomplished by the GWAC and County staff with limited assistance from consultants.

The GWAC analyzed existing local and state policies and procedures which relate to ground water management to identify where improvements could be made. Twenty management options were evaluated, of which fourteen were recommended for immediate implementation in Island County. These recommended options are considered the preferred program (See Section VI). The remaining options, or the ongoing options, will be subject to periodic review for feasibility of incorporation into the GWMP at a later date.

#### D. ENVIRONMENTAL REVIEW

The GWMP is subject to environmental review pursuant to the State Environmental Policy Act (SEPA, RCW 43.21C). Each option discussed in the Alternatives Section (Section V) includes a discussion of possible significant adverse environmental impacts. These discussions are intended to assist the responsible official (the Island County Planning Director) to decide whether a significant, adverse environmental impact will result from implementation of the GWMP (a threshold determination). The final draft of this document may be modified following public input; thus, the Planning Director will issue the threshold determination following these possible modifications.

#### E. ACKNOWLEDGMENTS

The development of the Ground Water Management Plan would not have been possible without the cooperation and dedication of the membership of the Ground Water Advisory Committee and that of the Planning and Health Department staff. Non-GWAC County staff deserve special thanks for their patience and accuracy in responding to questions and for their putting up with many hours of waiting for copying machine time. The assistance from consultants and various state and local agencies is also greatly appreciated. The development of the GWMP was an enormous task, and all who contributed have earned the appreciation of all of Island County.

## SECTION II

### AREA CHARACTERIZATION

#### A. INTRODUCTION

The intent of this chapter is to provide a summary characterization of what is currently known about ground water resources of Island County. The hydrogeologic assessment presented in the Island County Ground Water Management Plan Part A Technical Memorandum - Hydrogeologic Characterization and Background Data Collection Relating to Ground Water Protection and Management (Economic and Engineering Services, Inc., 1990) is condensed and summarized in this chapter (This document is referred to the Hydrogeologic Characterization for the purposes of this text). Since the Hydrogeologic Characterization and other ground water evaluations have been extensive and comprehensive (CWSP, 1990; Sapik et al., 1988), this summary is intended to consist of an overview of the main elements outlined in these reports. The reader is referred to the Hydrogeologic Characterization (Appendix A) for supporting information.

The Hydrogeologic Characterization is based only on existing data that were available at the time the study commenced during late 1987. The primary data sources included information in the files of the United States Geological Survey (USGS), water resource reports by the USGS, Department of Ecology (Ecology), and consultants. No additional data have been collected or analyzed. The Hydrogeologic Characterization is designed to serve as a resource document to be used for future evaluation of ground water management strategies in Island County.

The Hydrogeologic Characterization addressed the following elements: physical characterization, hydrogeologic characterization, historic and recent water quality and quantity trends, land uses potentially affecting ground water, projection of long-term ground water needs, and summary of management jurisdictions and existing policies which are relevant to ground water management. These elements are addresses separately but are interdependent.

#### B. PHYSICAL CHARACTERIZATION

Island County is situated in the Puget Sound lowland of western Washington, northwest of Seattle. The County consists of two major Islands, Whidbey and Camano, and several smaller islands. Land area in the County totals over

210 square miles. Both Whidbey and Camano Islands are long and narrow and are characterized by rolling uplands 100 to 300 feet above sea level and steep bluffs along the coasts. In a few places, uplands are 500 feet above sea level. A large percentage of the islands are forested, especially the inland areas. The remainder consists predominantly of urban and agricultural lands, range and barren land, wetlands, and lakes.

Island County has a temperate marine climate, typically consisting of warm, dry summers and cool, wet winters. Mean annual precipitation ranges from approximately 20 inches in Coupeville to 42 inches at Lake Goss. The rainfall rate is usually less than 0.5 inches per day. Mean annual temperature is 50 °F, with an average winter and summer temperature of 38 °F and 61 °F, respectively.

### C. HYDROGEOLOGIC CHARACTERIZATION

Most of the surface of Whidbey and Camano Islands consists of till, glaciomarine drift, gravel, and sand deposited during the last glaciation, 14,000 years ago. Older glacial and interglacial deposits can be found exposed along sea cliffs. Deposits of at least three glaciations can be recognized in Island County (Easterbrook, 1968).

The ground water flow system in Island County consist of 5 aquifers zones (A through E), each consisting of a series of water bearing zones (aquifers) surrounded by zones of low permeability sediments (aquitards). Hydrogeologic cross sections (Hydrogeologic Characterization, Exhibit II.4-1 through 14) show the location of the aquifer zones.

Recharge of ground water flowing through the ground water system comes mainly from precipitation. No ground water data exists which supports the existence of a underground water source originating in the Cascade or Olympic mountains. A large percentage of this precipitation is lost by runoff, transpiration by plants, or evaporation, leaving only a small percentage to recharge ground water. Infiltration potential of the soil and hydraulic gradients are also important factors that control recharge. The role of forest canopy retention in ground water recharge has not been investigated in Island County and remains unclear. Ground water flows from recharge areas to discharge areas, generally towards the sea. Potentiometric contour maps indicate the direction of flow within each aquifer zone (Hydrogeologic Characterization, Exhibit AII.5-1 through 20).

A pumping well alters the natural ground water flow causing water to flow towards it. If a well is located near the

coast, pumping may induce the movement of seawater into the aquifer and resulting in flow inland towards the well.

There are 130 individual watersheds in the County. The role of watersheds in ground water management, although recognized, involves a complex interrelationship which in most cases remains poorly defined and understood.

#### D. WATER QUALITY AND QUANTITY TRENDS

The principal dissolved chemical constituents in ground water in Island County are calcium and magnesium. Naturally high calcium and magnesium concentrations are indicative of relatively hard water. The areas between Keystone and Ault Field at NAS Whidbey Island and northeast Camano Island are the principal areas with characteristically hard water; however, there does not seem to be any established geographic pattern to the occurrence of hard water in the County.

Seawater intrusion is documented in four of the Focus Areas identified in the County (Problem Definition, III-3). In areas affected by seawater intrusion, ground water contamination is predominantly by sodium and chloride ions. Although specific sources of chloride are undetermined, it is assumed that seawater surrounding the islands is the predominant source in Island County. Seawater intrusion can be reduced by modifying pumping rates, decreasing the concentration of wells, and locating wells inland and away from the coast.

Limited ground water data available in the County has made establishing water quality and quantity trends difficult. Seasonal changes in chloride concentrations of ground water have been documented (Garland and Safioles, 1988); however, existing data does not indicate long term trends (Sapik et al., 1988). Existing water level and quality data from 1978 to 1983 indicates only a few local trends in isolated wells. Visual and statistical analyses showed little correlation between water levels in the aquifers and water quality as indicated by chloride, except in Focus Area 1 and 3 (Problem Definition, Figure III-1). Limited water quality data of agricultural chemical concentrations are available to evaluate trends.

#### E. LAND USES

The impact of human activities on the quality and quantity of water resources in Island County has made ground water management a necessity. General effects on ground water are related to land use and population growth, agricultural activities, and ground water quality impacts. Section III-1



of the Hydrogeologic Characterization describes all land surface activities in the County to evaluate potential groundwater impacts. The location of these activities is identified on land and site use maps (Hydrogeologic Characterization, Exhibit III.A-1 and III.A-2). The inventorying and evaluation of land uses in Island County has been significant in identifying sites which are of particular significance to ground water protection.

#### F. PROJECTION OF GROUND WATER NEEDS

Island County has experienced a growth rate which has increased its population by 30% in the last ten years. Growth is expected to continue in both permanent and seasonal populations. The sole source aquifer designation is supported by the existence of a finite ground water supply in the County. The Hydrogeologic Characterization summarizes all ground water demand projections, including municipal and domestic, single domestic, irrigation, and other water demands, and compares them to water rights. Based on population and usage estimates, the total ground water demand is projected to increase by 181% in the next 50 years.

#### G. LAND AND WATER USE MANAGEMENT AUTHORITIES

Ecology, the Department of Health (DOH), and Island County are the key jurisdictions and authorities in managing and protecting ground water resources in Island County. Specific water resource authority granted to these agencies are described in the Hydrogeologic Characterization (Section III.2). Ecology has the primary authority over water resources by state law. Their authority resides in both the allocation of water to beneficial uses, and protection of water quality. DOH has the authority to approve water systems and enforce compliance of water quality standards for potable water supplies. In addition, DOH has the authority to ensure that public water systems are properly managed in the public interest. The County has direct authority over water resources through local planning and health jurisdictions. Some of these authorities include the implementation of SEPA and the regulation of on-site domestic waste disposal.

### SECTION III

#### PROBLEM DEFINITION

This chapter contains a summary of the confirmed and potential ground water quality and quantity problems in Island County. The discussion also identifies various water and land use activities which impact ground water, and predicts the likelihood of future problems and conflicts if no action is taken. Areas where insufficient data exists to define the nature of existing and potential ground water problems are documented. Various ground water policy issues to be examined and developed during the Ground Water Management Program (GWMP) are also discussed.

##### A. INTRODUCTION

Ground water is vital to all inhabitants of Island County. Assuming the City of Oak Harbor relies primarily on pipeline water and using 1990 population estimates (Washington State Office of Financial Management, OFM, April 1990), approximately 75% of the residents of Island County depend exclusively on ground water as their sole source of drinking water. The City of Oak Harbor, Naval Air Station (NAS) Whidbey, and the North Whidbey Water District are served by two parallel pipelines providing water from the Skagit River. The City of Oak Harbor supplements this source with well water from three deep wells, with a combined capacity of 480 gallons per minute (gpm). These wells are used for leveling peak day demand as needed.

Island County has experienced considerable growth with an 1990 population of 60,195 permanent residents (US Census Bureau, 1990) and approximately 14,190 summer and/or weekend residents (Island County Planning Department (ICPD), Island County Coordinated Water System Plan (CWSP), January 1990, Table III-1) served by over 650 public water systems and an unknown number of private wells. In 1983, approximately 84% of ground water demand was for residential, industrial and commercial uses and the remaining 16% was for agricultural irrigation purposes (Sapik et al., 1988).

With increasing demand due to rapid population growth and evidence of a finite supply, a problem facing residents is ensuring the future availability of ground water. To assist in understanding the complexity of the ground water situation it is helpful to divide the problem into the following six components:

B. CONFIRMED GROUND WATER PROBLEMS

1. Seawater Intrusion

C. POTENTIAL GROUND WATER PROBLEMS

1. Waste Disposal Sites
2. Hazardous Waste
3. Nitrate Contamination
4. Bacteriological Contamination
5. Chemicals and Pesticides
6. Underground Storage Tanks
7. Transport of Hazardous Materials
8. Climate Changes

D. GROUND WATER USAGE

E. GROUND WATER RECHARGE

F. HYDROGEOLOGIC AND OTHER DATA DEFICIENCIES

G. GROUND WATER POLICY ISSUES

1. Land Use
2. Water Resource Regulations

SUMMARY

REFERENCES

## B. CONFIRMED GROUND WATER PROBLEMS

The following confirmed ground water problem category is supported by data collected by the Island County Health Department (ICHD), the Washington State Department of Health (DOH), the Department of Ecology (Ecology) and the United States Geologic Survey (USGS). Presently, there is insufficient information to determine the precise geographic and hydrogeologic extent of seawater intrusion in the County. For example, the existing data are inadequate to conclude whether seawater intrusion is a result of regional stresses on the overall hydrogeologic system, or of localized stress on the ground water system. Background chloride concentrations may be as high as 40 parts per million (ppm) in some areas and may suggest that chlorides occur "naturally" in ground water.

### 1. Seawater Intrusion

Seawater intrusion is the most widely recognized problem in Island County and has been confirmed in a number of areas (identified below). Oceanic island environments like Whidbey and Camano Islands are particularly susceptible to seawater intrusion, where increasing development and pumpage may cause aquifers to be subject to contamination due to the migration of seawater (Sapik et al., 1988).

Seawater intrusion is due to the movement of the freshwater-seawater boundary, or the zone of diffusion, in response to fluctuations in the water table. Water table fluctuations are caused by changes in recharge, pumping of wells, discharge into springs and streams, and tidal fluctuations. Possible mechanisms of seawater intrusion can be either lateral migration of the zone of diffusion or upconing of the zone of diffusion toward the well intake (Garland and Safioles, 1988). Fluctuating chloride and conductivity levels, which are indicators of seawater intrusion, may occur seasonally, especially in wells with water levels close to or below sea level. As withdrawal of ground water increases, well water levels can be expected to fall. With lowered water levels, the zone of diffusion adjusts by migrating landward producing a greater potential for seawater intrusion. Seawater intrusion tends to occur in narrow parts of islands, coastal areas and lowlands (Walters, 1971).

Aquifers which are present below sea level in practically all shoreline areas are susceptible to contamination by lateral movement of seawater toward pumping wells, and deep wells inland are subject to contamination by upconing of seawater.

The degree of pumping and the distance from shoreline that will cause seawater intrusion by either mechanism varies with local conditions (Walters, 1971).

There have been numerous USGS/Ecology cooperative investigations of the occurrence of seawater intrusion in Island County. Walters (1971) and Dion and Sumioka (1984) examine the occurrence of seawater intrusion in coastal areas of Washington and summarize the concentrations of chlorides in ground water collected from wells within one mile from the coast. Cline et al. (1982) describe the hydrogeology of the ground water flow system and present maps showing the extent of seawater intrusion. Jones (1985) presents maps and cross sections showing the extent and thickness of aquifers and confining units, and the extent of seawater intrusion. Most recently, Sapik et al. (1988) evaluate seawater intrusion on a regional scale in Island County using simulation of ground water flow in aquifers containing seawater and freshwater.

Seawater intrusion, as indicated by elevated chlorides and conductivity, has been documented in the following geographic locations, or Focus Areas (GWMP Technical Memorandum, September 1989). The Focus Areas have been defined based on existing data which indicate that water quality has deteriorated as the result of seawater intrusion and/or that over pumping of ground water may lead to quality and/or quantity problems (Exhibit III-1). The Focus Areas boundaries represent a group of adjacent watersheds defined based on their ground water quality history. The Focus Areas are defined as follows:

Focus Area No. 1 - Central Whidbey (See Exhibit III-1)

This area is defined by the area south and west of Oak Harbor and Crosby Watersheds, and including West Beach, Coupeville, Ebey's Prairie, and the area of central Whidbey north of Admiral's Cove.

Example: Several water systems in the area of West Beach have had a history of chloride levels exceeding 100 ppm. Water quality analysis for one water system for August 1987 and January 1988 showed 190 and 230 ppm chloride, respectively (DOH, Public Water Supply System Listing, Island-SWI, March 3, 1989).

Focus Area No. 2 - South Camano (See Exhibit III-1)

This area comprises the southern "Panhandle" of Camano Island, including the O-Zi-Ya Watershed to the southern tip of Camano Island.

NOTE: BOUNDARY OF FOCUS AREA NO. 5 FOLLOWS WATERSHED BOUNDARIES.

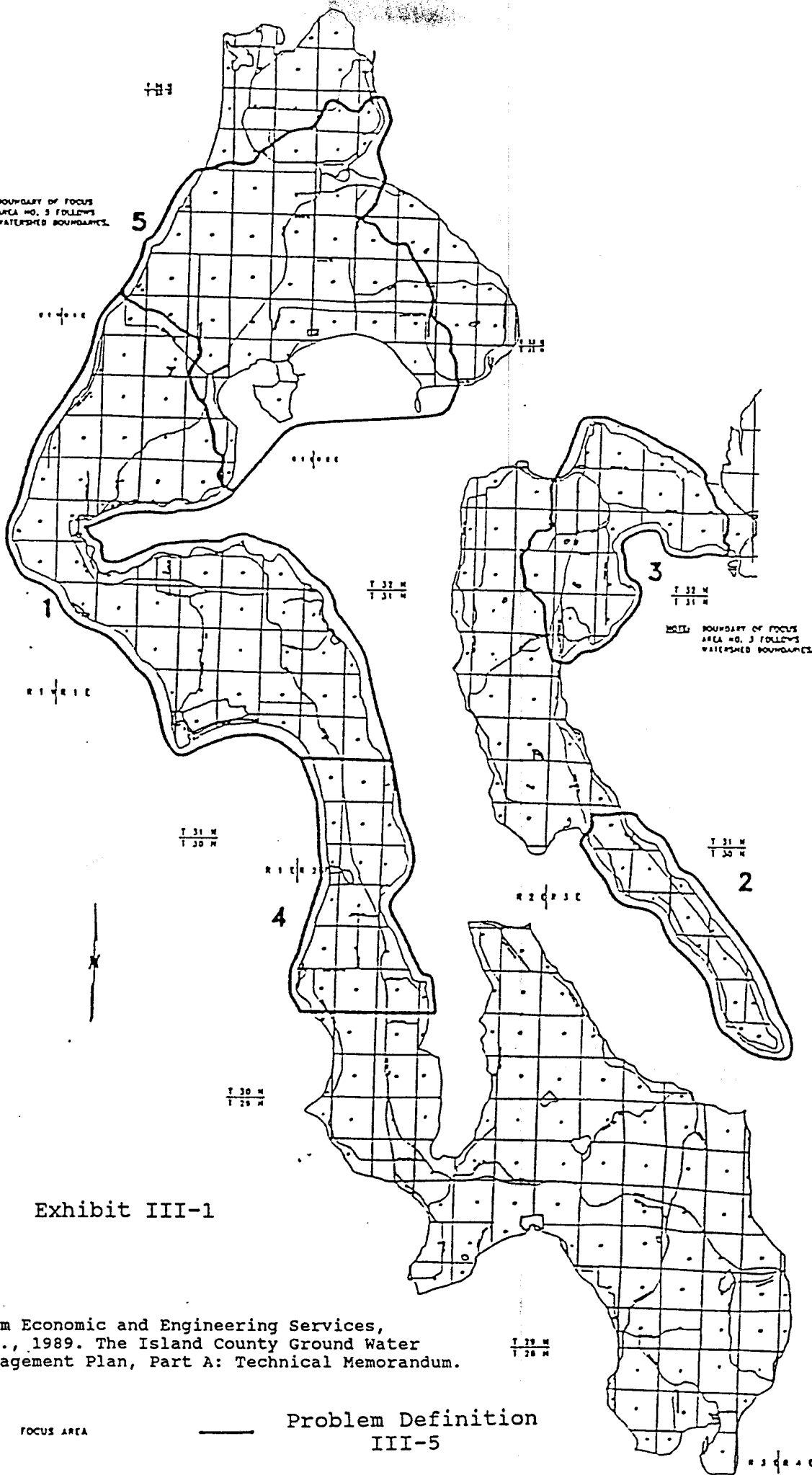


Exhibit III-1

From Economic and Engineering Services, Inc., 1989. The Island County Ground Water Management Plan, Part A: Technical Memorandum.

FOCUS AREA

Problem Definition  
III-5

Example: From May 1985 to May 1987, Garland and Safioles (Ecology, 1988) investigated seasonal variations in chloride in eighteen water systems on Southern Camano Island. Eleven of these systems were found to have chloride levels exceeding 100 ppm during the study period. Chloride concentrations in the systems sampled ranged from 12 to 985 ppm. Variations in chloride concentrations followed a similar pattern in the affected water systems, with minimum levels recorded in November through April and maximum concentrations recorded around August. The relationship between pumpage and chloride concentrations and the erratic distribution of high chloride occurrences in the sampled wells suggests upconing of seawater is occurring beneath overpumped wells.

A water service connection moratorium exists on a water system on South Camano whose chloride levels exceeds the MCL seasonally (ICHD, Water System Moratorium List, July 1990). A summer chloride concentration of 250 ppm has been reported for this system (July, 1985).

#### Focus Area No. 3 - Northeast Camano (See Exhibit III-1)

This area consists of northeast portion of Camano Island, from the Triangle and Arrowhead Watersheds, inclusive.

Example: Several public water systems in this Focus Area have chloride concentrations exceeding 100 ppm. A moratorium on the issuance of water service connections has been placed on a water system in this area due to chloride levels above the MCL (ICHD, Water System Moratorium List, July 1990). A chloride concentration of 595 ppm has been reported for this system during the summer (June 1987).

#### Focus Area No. 4 - Greenbank Area (See Exhibit III-1)

This area is located near Greenbank, comprising Sections 31, 32, and 33 of T31N R2E, and south to Sections 19, 20, 21, and 22 of T30N R2E, inclusive.

Example: A number of wells in Greenbank and vicinity are characteristically elevated in chlorides and conductivity. South of Greenbank, along the coastline, one well has chlorides ranging from 850 (June 1986) and 1500 ppm (October 1987) and is regularly monitored as part of the ICHD Chloride Monitoring Program.

## Focus Area No. 5 - North Whidbey (See Exhibit III-1)

The area comprised of Dugualla, Navy, Clover, Crescent, Oak Harbor, and Crosby watersheds.

Example: Waste disposal activities associated with NAS Whidbey Island are of primary concern to ground water in this Focus Area. Lab analysis of USGS test well #2 indicated chloride levels of 2200 ppm at 430 feet (USGS lab results, 1983).

Most areas affected by seawater intrusion are located near shorelines, and increases in chloride content appear to occur in aquifers C and D, both primarily below sea level (Sapik et al., 1988).

Seawater intrusion has impacted the quality and quantity of potable water supplies in at least four out of the five Focus Areas, and therefore, has been identified as a priority concern in ground water management. Heavy ground water pumping is not always the prerequisite for the occurrence of seawater intrusion. Additional development can further impact seawater intruded areas and could initiate the occurrence of seawater intrusion in areas which are presently unaffected.

### C. POTENTIAL GROUND WATER PROBLEMS

The following problem categories are described as "potential" threats to the quality and quantity of ground water in Island County. Although these have not been confirmed to be actively degrading the quality of the resource, they should be treated with similar considerations with which confirmed problems are treated in ground water management. Because of the cost and effort involved in ground water remediation, coordinated prevention activities are preferred.

#### 1. Waste Disposal Sites

Active and inactive land disposal facilities (solid waste landfills, landspreading operations, waste piles and surface impoundments) pose potential threats to ground water quality through the leaching of contaminants. There are two active (Naval Air Station and Coupeville disposal sites) and seven abandoned or closed landfills in Island County (Exhibit III-2).

A report on the Island County Ground Water Assessment and Monitoring Program (Sweet, Edwards & Associates Inc., 1986)



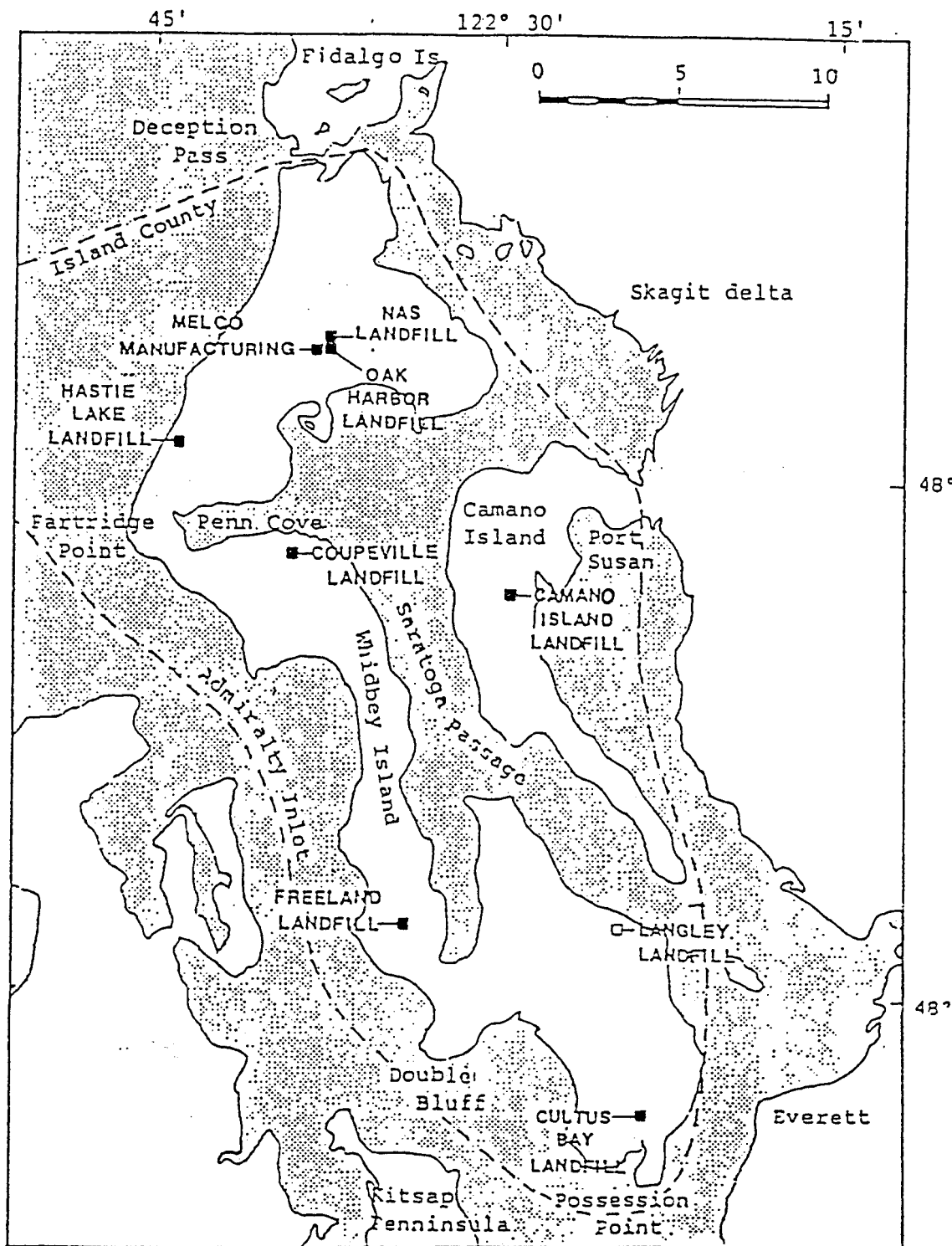


Exhibit III-2

From Sweet, Edwards & Associates, Inc., 1986. Island County Ground Water Quality Assessment and Monitoring Program Final Report. Based on Island County map from Water Supply Bulletin 25.

evaluated the contamination potential in areas in the vicinity of current or former land disposal facilities on Whidbey and Camano Islands. The study characterized ground water conditions in the vicinity of nine current and former waste disposal facilities and recommended monitoring strategies for each site. The study indicates that the potential for contamination at the eight landfill sites studied is increased by the lack of effective landfill cap and other engineered measures to reduce leachate generation.

The study resulted in the drilling of two monitoring wells at the Coupeville Landfill and three at the Freeland site. Nine additional ground water monitoring wells have been installed at the Coupeville Landfill. The monitoring network at both sites consists of quarterly sampling of parameters outlined in the Minimal Functional Standards for Solid Waste Handling (WAC 173-304). Results of ground water analysis indicate both sites meet EPA primary drinking water standards (ICHD, Quarterly Ground Water Monitoring, 1990).

In February 1990, two sites on Naval Air Station (NAS) Whidbey Island (Ault Field and the Seaplane Base) were nominated to the National Priorities List of the U.S. Environmental Protection Agency (EPA) due to the severity of the toxic contaminants identified. These sites include thirty one areas at Ault Field and thirteen areas at the Seaplane Base.

NAS Whidbey Island is conducting an investigation at the NAS Whidbey Island Landfill located north of Oak Harbor to determine how past disposal activities have affected ground water. Disposal operations involving the burial of waste in trenches located on relatively flat terrain has been ongoing since 1956. Although a contaminant plume from this site does not appear to pose an imminent ground water threat, the area is being monitored regularly by DOH to determine water quality of nearby wells. Pursuant to State and Federal policies regarding ground water remediation programs, remediation at these sites may include a pump and treat program with the reinjection of the treated water back into the aquifer. These treatment technologies may involve the treatment of substantial amounts of ground water over long periods of time.

State locational standards for solid waste land disposal facilities prohibit the siting of land disposal facilities in areas designated sole source aquifers (WAC 173-304-130(2)(b)(ii)). Accordingly, the construction of a new Island County landfill requires a variance for the Minimum Functional Standards for Solid Waste Handling. Instead, by 1992, the County plans to develop a transfer facility to

transport solid waste materials out of the County to one of several regional landfill disposal facilities in Washington or Oregon.

Significant capital improvements and upgrade facilities are being planned for the Island County and NAS Whidbey Island landfills in the future. An expansion of the Coupeville Landfill has been recommended so the facility may accommodate the Island County waste stream through the year 1992. The landfill facility has obtained a variance from the Minimum Functional Standards for Solid Waste Handling (WAC 173-304) until November 1991. The variance requires the County to adopt a compliance schedule to satisfy the minimum standards. The County plans to install a cap on the cell and install a drainage system. A permit application for use of a new cell for inert and demolition waste has been submitted to the local health department.

Island County's Comprehensive Solid Waste Management Plan (August 1990) develops a plan for managing municipal solid waste, inert waste, sewage sludge, infectious waste, and septage. A proposed interlocal agreement is in process with Snohomish County for a plan to dispose of the Camano Island waste stream in Arlington.

In 1985, a County policy was established which promotes the beneficial use of sewage sludge for agricultural, forestry, and land reclamation purposes. Although generally acceptable as a viable management alternative, there have been difficulties in identifying potential utilization sites.

Current estimates suggest that 1.2 million gallons and 200,000 gallons of septage are generated annually on Whidbey and Camano Islands, respectively. Temporary septage handling practices on Whidbey Island involves the transport and disposal of septage to the City of Bellingham's wastewater treatment facility. Septage generated on Camano Island is transported to the City of Stanwood's municipal wastewater treatment facility. Island County is attempting to formalize this arrangement and participate in an evaluation of the plants capacity to accommodate septage through a specific planning period (Kwarsick, 1990).

Engineering and design plans are presently underway for the development of a septage treatment and utilization facility on Whidbey Island. An Environmental Impact Statement (EIS) is being prepared concurrently.

## 2. Hazardous Waste

During 1989-1990, Island County refined the Moderate Risk Waste Management Plan which outlines a strategy for removing most hazardous waste from the solid waste and wastewater streams based on planning guidelines developed by Ecology. Presently, the Moderate Risk Waste Management Plan is in the final stages of adoption. The recommended moderate-risk waste management strategy for Island County includes three elements:

- o Public and business information and education,
- o Collection of unregulated quantities of hazardous waste using a permanent drop-off collection and storage facility at the Coupeville Landfill and a mobile collection station, and
- o Treatment and disposal of the collected waste materials.

The plan also recommends a County policy assigning responsibility for proper handling of moderate-risk waste to waste generators.

Three household hazardous waste collection programs held in the County between 1986 and 1987 were successful in educating the public about the potential problems associated with small quantities of hazardous waste and in identifying the types of household wastes generated. The results of collection-day events and other community studies indicate that about 37,000 gallons of household hazardous wastes are generated each year in Island County. A large percentage of this is motor oil and paint which can be relatively easy to handle and recycle. The Solid Waste Department collects oil at its recycle parks.

In a 1988 survey, the majority of commercial and industrial generators were found to manage their moderate-risk wastes in an acceptable manner and they have been more successful than the public in understanding the problem. Some commercial generators are unaware of the State and Federal regulations that defined waste materials as dangerous or hazardous, and others may not subscribe to collection services. Other businesses and institutions chose to store waste on-site instead of participating in collection and disposal programs. This is permissible if an accepted procedure for eventual disposal is followed.

Although the disposal of hazardous waste is controlled under the Federal Resource Conservation and Recovery Act (RCRA) and the applicable State law, a continued local effort to protect ground water from adverse public health and environmental impacts relating to small quantities of hazardous waste

is necessary and presently underway in Island County.

### 3. Nitrate Contamination

The movement of nitrate into ground water is a potential threat to ground water supplies in Island County. Nitrate can originate from on-site sewage systems in densely populated areas, excessive fertilizer applications, poorly designed high-density animal confinement operations, and topsoil production operations. Nitrate is a highly soluble resistant product of aerobic degradation of wastewater and consequently can be readily transported by ground water. Excessive amounts of nitrate in drinking water can cause a blood disorder in newborn babies called methemoglobinemia, a condition which prevents the normal uptake of oxygen in the blood. Infants (less than one year old) are especially susceptible to methemoglobinemia (DOH, Toxic Substances Fact Sheet, January 1989).

The ICHD has identified several water systems with nitrate levels above the MCL (Maximum Contaminant Level) set by EPA (10 ppm). For example, a number of wells in the Mutiny Bay area have had a history of nitrates at or exceeding the MCL. Concentrations of up to 25 ppm nitrate (August, 1988) have been reported in this area. The cause of elevated nitrates in this area remains unidentified.

Development density can be directly related to nitrate contamination of ground water. If wastewater is distributed over a larger geographic area, the localized buildup of contaminants like nitrates can be avoided. Sewage Waste Disposal (ICC 8.07B) establishes minimum gross land area for subdivisions proposing to utilize on-site sewage systems. In residential areas with ideal soil types, no more than 3.5 dwellings or sewage systems are permitted per acre. The minimum requirements are conservative and are designed to adequately protect ground water and preserve and promote public health.

Although nitrate contamination of drinking water supplies has only been confirmed in isolated water systems in Island County, population growth trends indicate the need to control various land uses which may introduce nitrates into ground water.

### 4. Bacteriological Contamination

No occurrences of bacteriological contamination to ground water have been reported in Island County, though, bacteriological contamination of ground water has been linked to intrusion of sewage from on-site sewage systems (Cogger,

1988). ICC 8.07B provides specific sewage system design requirements to control and prevent bacteriological contamination of ground water in Island County. Generally deep wells that are cased and sealed to state specifications have few organics (American Water Works Association, Opflow, July 1990).

## 5. Chemicals and Pesticides

Residential, agricultural, institutional, and commercial uses of chemicals and pesticides in Island County are potential sources of surface water and ground water contamination. Water quality data for pesticides have not been collected widely in Island County and to date it is unknown if they are present in ground water. It has been estimated that annual private household pesticide use in the Puget Sound Basin represents 20% of the total urban/suburban use; whereas agricultural uses appear to represent just over 10% of the total urban/suburban use (Tetra Tech, 1988 in Issue Paper: Pesticides in Puget Sound, March 1990).

A July 1987 EPA survey of pesticide use in vulnerable ground water areas in the State of Washington designated Island County as a region which may be susceptible to contamination from the use of agricultural chemicals based on local geology and irrigation practices. The study involved an inventory of leachable pesticides used in the County which EPA has identified as having a high potential to leach through the soil based on chemical characteristics.

Previous and current pesticide use combined with natural climatic and geologic conditions in Island County support the need to protect ground water supplies from the impacts of chemical and pesticide contamination.

## 6. Underground Storage Tanks

In a March 1988 EPA inventory, 303 underground tanks were reported in Island County. According to Ecology, there are 265 regulated underground storage tanks (USTs) in the County (April 1990). These tanks are associated with gas stations, air fields, agricultural operations, and small industries. The inventories exclude residential home heating oil storage tanks and may not take into account those tanks that have been abandoned. All may pose a potential hazard of undetected leakage to ground water. According to DOH (Toxic Substances Fact Sheet, November 1988), UST characteristics which are most commonly associated with leaks are:

- o Over 15 years old
- o Of singled-walled construction

- o Have no leak detection system
- o Have no internal or external protection against corrosion

There are no data conclusively demonstrating that USTs are presently a source of ground water contamination in Island County. The sole source aquifer designation for Island County, however, indicates that the islands possess physical characteristics which make them especially vulnerable to threats from leaking USTs.

## 7. Transport of Hazardous Materials

Although only minor spills have been reported to date, spills of hazardous materials from pipeline leaks and along public, private, and military installation roadways could impact surface water quality with possible contamination of ground water supplies. Information on the amount and variety of hazardous waste transported along the County's roadways is not available at present. Other problems related to vehicular traffic is the possibility of lead buildup and other contamination in roadway drainages. Ecology and the Island County Engineering Department are presently developing highway drainage and surface water programs to address the potential for contaminants being introduced along roadways in the County.

The Island County Comprehensive Plan (p. II-17, 2f) has provisions which discourage the construction and operation of major energy facilities, including the transport or storage of petrochemicals or petroleum in the County. This policy was initiated because of the potential for adverse environmental impacts to ground water and the marine environment of Puget Sound associated with industrial facilities and other activities of this nature.

## 8. Climate Changes

The Intergovernmental Panel on Climate Change, a panel representing 39 countries, is presently charged with reporting on the state of scientific knowledge about the greenhouse effect. In their May 1990 report, the Panel indicated that unless emissions of greenhouse gases are cut immediately by more than 60%, global mean temperature could increase up to 5.4 degrees Fahrenheit by the end of the 21st century. Computer simulated models predict a 2 to 6 foot sea level rise by the year 2100. A sea level rise of this magnitude could result in significant adverse environmental impacts associated with ground water, including seawater intrusion, inundation of shoreline environments, and displacement of wetlands.

The potential long-term impacts of the greenhouse effect on ground water resources in Island County need to be recognized. Current research evidence indicates sea level is rising, and the rate of rising may increase substantially in the future. There is uncertainty, however, as to both the exact timing and magnitude of accelerated sea level rise (Canning, 1990).

#### D. GROUND WATER USAGE

Increased withdrawals associated with a growing population increase the potential for seawater intrusion and other ground water problems. Population growth trends and estimated water usage figures have generated cause for concern in planning efforts to safeguard and maximize the ground water available for present and future uses. Although estimates may vary as to the specific growth trend, it is important to emphasize that the status quo of ground water supply and demand can not be used to accurately estimate future ground water needs. While somewhat site specific, the ground water demand accompanying population growth is inversely related to the ground water available for use, where increasing demand may accompany a decreasing supply.

Since 1980, Island County has been one of the fastest growing counties in Washington State (OFM, Population Trends, 1989). The 1990 U.S. Census population count for Island County indicates a population of 60,195. Exhibit III-3 represents population projections through the year 2000 published by OFM. According to Island County Planning Department high growth projection, the residential population was forecasted to increase 41% from 1980 (44,000) to 1990 (62,100) (Note: April 1990 OFM census data indicates a 1990 population of 59,200; see Table III-1). During this same period, seasonal population was forecasted to increase 27% (from 11,200 to 14,190).

Table III-1 represents more current estimates of water consumption in the County based on OFM population projections (August 1989 and April 1990), ICPD seasonal projections, and a factor of 100 gallons per capita per day (CWSP accepted value of average daily use). The total annual ground water demand for Island County in 1980 was approximately 1785 MGY (million gallons per year) or 5,477 AFY (acre feet per year) and is projected to increase to 2,897 MGY or 8,889 AFY by the year 2000. This represents a 62% increase in water consumption in 20 years.

Certain fundamental hydrogeologic concepts associated with



# Exhibit III-3

## ISLAND COUNTY POPULATION TRENDS

From Economic and Engineering Services, Inc.,  
1990. The Island County Coordinated Water  
System Plan Volume I.

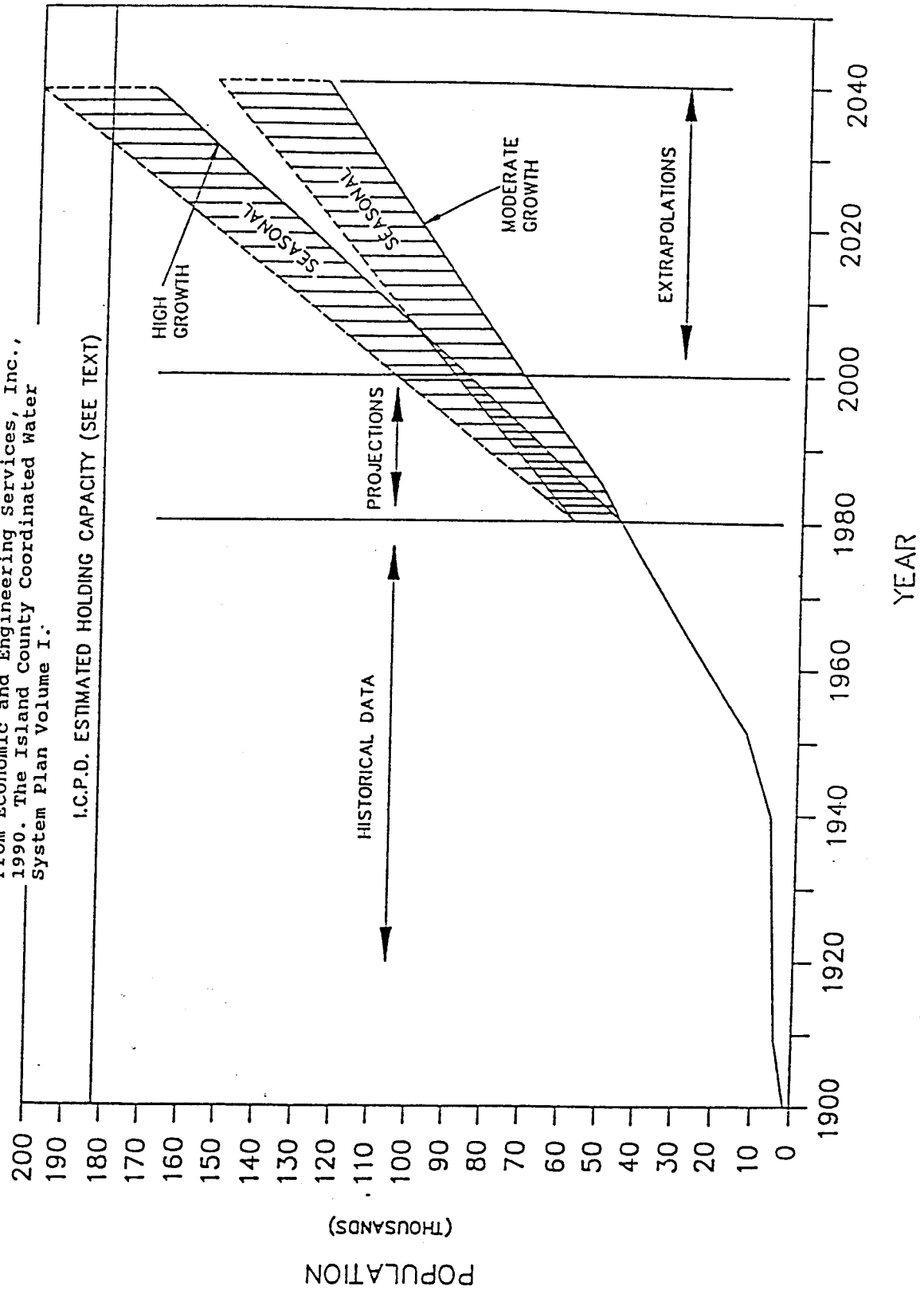


TABLE III-4

## Island County Water Consumption (1)

The following estimates are based on Island County Planning Department (ICPD) and Washington State Department of Financial Management (OFM) population projections. These water consumption estimates include water consumed by individuals served by the Anacortes pipelines providing water from the Skagit River.

PERMANENT			SEASONAL		TOTAL
Population OFM	Annual Consumption MGY <sup>(6)</sup>		Population ICPD (MGY) (3)	Annual Consumption (MGY) <sup>(4)</sup>	Total Consumption
1980 44,048 <sup>(2)</sup>	1,608		11,200	177	1,785
1985 49,201 <sup>(2)</sup>	1,796		12,650	200	1,996
1990 59,200 <sup>(2)</sup>	2,161		14,190	224	2,383
1995 64,548 <sup>(5)</sup>	2,350		15,895	251	2,601
2000 71,758 <sup>(5)</sup>	2,619		17,600	278	2,897
2010 86,808 <sup>(2)</sup>	3,168		21,010	332	3,500

## Footnotes:

- (1) Average day consumption based on 100 gallons per capita per day.
- (2) Permanent population estimates, Washington State Department of Financial Management, April 1, 1990.
- (3) Seasonal population estimates, using data collected by ICPD in EIS for the Island County Comprehensive Plan which projects seasonal population from 1990 - 2000. Beyond 2000, a constant increase is assumed.
- (4) Consumption by seasonal population at same per capita rate as resident, but assumes only 15% of capacity during 4 months a year.
- (5) From OFM, State and County Population by Age and Sex 1980-2000, August 1989.
- (6) According to pipeline water usage figures obtained from the City of Oak Harbor, annual water usage by the City of Oak Harbor and NAS Whidbey ranged from 669 to 917 MGY in the last five years (1986-1990).

the finite ground water supply in Island County have generated concern. Ground water pumpage in certain areas has allowed the seawater-freshwater interface to migrate towards the freshwater aquifer, causing seawater intrusion. Seasonal chloride analysis of water from public water systems on South Camano (Garland and Safioles, 1988) suggests that the severity of seawater intrusion in individual wells is dependent on the magnitude of pumping.

Visual and statistical analysis of data from a few isolated wells in aquifer C in the greater Coupeville Focus Area and in aquifer D in the northeast Camano Focus Area showed a correlation between water levels and chloride changes (See Appendix A, Hydrologic Characterization, p. II-8). This may suggest that water use and recharge balance in these areas are critical. Because of the limited water level data available in the County, however, long-term effects of pumping on ground water levels are presently unknown.

Water use in Island County has not been measured adequately to generate accurate estimates of future ground water demands. Neither water level nor water pumpage data is collected on a regular basis. With the exception of usage figures for approximately 30 source-metered water systems in the County, data are not readily available to determine the relationship that exists between water levels and pumpage County wide.

Population projections suggest that the demand and withdrawals of ground water in Island County will continue to increase in the future. With population growth and the accompanying development, exists the potential for a decrease in ground water recharge and an increase in ground water contamination. The occurrences of ground water problems associated with seawater intrusion, nitrates, pesticides, and other contaminants may increase without proper ground water management.

#### E. GROUND WATER RECHARGE

In addressing ground water quality and quantity problems in Island County, significant emphasis needs to be placed on the protection and enhancement of aquifer recharge. In Island County, recharge is directly responsible for providing an adequate supply of ground water to meet the existing and future ground water demands.

In April 1982, underground water sources that supply drinking water to Whidbey and Camano Islands were declared to be "sole source" aquifers by the EPA. The basis of the federal designation was that the aquifers are recharged only by rain

or other forms of precipitation. For this reason, it is preferable to be conservative in considering recharge in the County by assuming all land area to be equally important in promoting recharge to the ground water aquifers.

Most recharge occurs during the winter and spring months when precipitation is greatest. On the basis of land use and precipitation estimates in the County, 20% to 70% of the yearly precipitation in Island County actually recharges the aquifers (Jones, 1985). The remainder runs off in streams or is lost by evaporation or plant transpiration. The Technical Memorandum and the USGS (Sapik et al., 1988) provide a computation of recharge in the County based on a detailed evaluation of recharge and evapotranspiration. The differing recharge values obtained in these recharge analyses are a direct reflection of the methods and assumptions used. Although there are numerous accepted methods of evaluating recharge to ground water, data are insufficient to apply the known methodology in Island County to obtain accurate estimates.

Recharge to ground water is reduced by paving and building in open spaces which formerly served as recharge areas. Man-made impervious surfaces and drainage structures redirect water off the islands and into Puget Sound, thus further reducing ground water recharge. Reducing recharge in one area may initiate negative ground water impacts (ex. seawater intrusion) in adjacent areas.

Presently, recharge area characteristics and limitations are not directly considered in quantifying the availability of ground water, nor does an accurate delineation of such areas exist. Furthermore, there is limited correlation between the amount of recharge area necessary for aquifer replenishment for existing water users and the amount required to provide for increases in population density. As a consequence, new developments may decrease the recharge capabilities to aquifers serving existing wells by encroaching on their recharge areas.

Considerations for recharge protection and enhancement in ground water resource planning efforts should be emphasized in development decisions. Limiting impervious surfaces (ICC 17.02.150.1) has indirectly helped preserve recharge in certain developments. Land Development Standards (ICC 11.01) encourages recharge of storm water into the ground and recognizes the function of wetlands as possible areas of ground water recharge. Although, the detailed drainage plan requirements of ICC 11.01.110.c include provisions for retention/detention and infiltration facilities to handle surface water in excess of peak discharge, consideration of

these facilities for recharge enhancement is not required in all proposed developments.

Protection and enhancement of recharge to Island County ground water is critical to maintain an adequate supply of potable water. Increased development could reduce ground water recharge capabilities of the land surface unless measures are taken to better manage and direct ground water recharge.

#### F. HYDROGEOLOGIC AND OTHER DATA DEFICIENCIES

The greatest challenge in setting public policy on ground water protection and management is to develop public awareness that ground water resources are finite. While water demands can be estimated, it is difficult to determine accurately the actual quantity of ground water that may be withdrawn from the aquifers without harmful impacts to the aquifers. A general hydrologic characterization of Island County is difficult due to the complex environmental and hydrogeologic parameters which needs to be factored into the equations. Due to the complex geology, broad-based assumptions from the existing limited ground water data result in unreliable conclusions.

The hydrogeology of Island County reflects a complex series of glacial events that have acted over the region for the last 40,000 years. During at least three glacial advances and retreats, sand and gravel were deposited to form aquifers and silt and clay were deposited to form aquitards. Instead of a simple layer configuration, deposits vary in thickness and are discontinuous. The complicated hydrogeologic framework has been a major obstacle in efforts to define and manage ground water resources.

In the recent regional ground water study by USGS, the hydrogeologic designation of "aquifer zones" is used to refer to the ground water characterization of Island County. They concluded that the hydrogeologic data collected to date could be greatly improved by refining it with additional detailed investigations evaluating site specific and local problems.

A specific example of the nature of the hydrologic complexities encountered is in characterizing recharge in Island County. The GWMP Technical Memorandum provides estimates of the amount of water available for large recharge areas based on the best, but limited data available at that time. Unfortunately, certain items in this data need to be refined and some data used were assumed since no specific data exist for much of the County.

The suggested needs and procedures for additional ground water quality and quantity data are described in the GWMP Data Collection and Analysis Plan. The following areas have been identified as lacking data or requiring additional data collection:

- o County wide rainfall patterns, variations and amounts.
- o Evapotranspiration patterns County-wide.
- o Runoff in various watersheds as well as to storm drains in residential areas.
- o Water usage, both private and public, as determined through metering or estimates based on a selected number and type of metered wells.
- o Identification of abandoned wells.
- o Aquifer capabilities based on aquifer or pumping tests.
- o Long-term water level trends.
- o Definition of recharge potential associated with various vegetative covers, topography, soil types, etc.
- o Ground water quality trends

#### G. GROUNDWATER POLICY ISSUES

This section identifies existing policies and policy deficiencies which directly or indirectly influence ground water management in Island County. In certain cases, these policies may need to be amended or additional policies created to comprehensively protect ground water resources in the County.

##### 1. Land Use

The Island County Comprehensive Plan and Zoning Ordinance (ICC 17.02) regulate land use in the unincorporated areas of Island County. Optimal land use designations and policies to guide development are given in the Comprehensive Plan. The Zoning Ordinance divides the County into several land use classifications: Residential, Rural Residential, Agricultural, Forest Management, Non-Residential, Urban

Growth Areas, and Zones of Influence. Additionally, overlay land use classifications are provided to implement policies contained in the Comprehensive Plan and to protect sensitive features, including critical drainage areas and water resource management areas.

The existing Comprehensive Plan and the Zoning Ordinance were developed without benefit of recent studies indicating ground water limitations in Island County. The Comprehensive Plan outlines policy guidelines for management of water resources in the context of land use and environmental planning, but was not intended to provide specific guidance to future ground water planning efforts.

The Zoning Ordinance provides for the possible establishment of a water resource overlay zone, under which areas with limited ground water availability or which are important recharge areas would be subject to special development standards and densities. Due to lack of sufficient data required to identify and map these areas, however, water resource overlay zones have not been established.

The Comprehensive Plan states that "Aquifers and aquifer recharge areas should receive special protection." Limited procedures exist, however, for maintaining and enhancing recharge in the County. ICC 17.02.150 identifies maximum impervious surface ratio requirements for Planned Residential Developments (PRDs) based on gross site area of the property. For example, no more than 50% of a site area should be impervious in a PRD located in a residentially zoned neighborhood. The open space ratios were designed to help preserve the County's rural character and to protect sensitive and resource lands, including water resource lands. Due to the difficulty of establishing the amount of recharge area necessary to provide an adequate amount of water to existing and future uses, however, the effectiveness of the established ratios is undetermined.

## 2. Water Resource Regulations

### a. General

Federal, State and Local laws and ordinances are simultaneously involved in issues dealing with management and allocation of ground water. The abundance of rules and procedures has made it difficult to assure that maximum use is made of all existing ground water policies and program mechanisms.

Presently, a consistent state-wide definition of seawater intrusion does not exist. Ecology has formed a Seawater

Intrusion Team and is presently working on a draft plan to control and prevent seawater intrusion under the existing regulatory authority.

In July 1989, the ICHD and DOH adopted a Salt Water Intrusion Policy. The seawater intrusion evaluation process involves classifying new, expanding and non-expanding public water systems into one of three risk categories based on existing water quality parameters. Water systems which exceed chloride levels of 250 ppm, the Maximum Contaminant Level (MCL) established by State Drinking Water Regulations (1989), have moratoriums placed on all new hookups until mitigating measures are developed. Public water systems which contain 100 ppm or greater chlorides may be subject to further evaluation or conditions of approval including monitoring, design modifications, metering, conservation practices, and phased development. Through this policy it is hoped that the problem of degradation of drinking water quality or loss of a water system source due to seawater contamination will be reduced or eliminated.

Although the ground water supply in Island County is limited, the construction of additional wells occasionally precedes efforts to employ conservation as a primary alternative. The following comprise water conservation requirements for new and expanding water systems as outlined in the CWSP:

- o Installation of individual and source meters;
- o Implementation rate structures that encourage water conservation;
- o Develop and implement leak detection and repair program;
- o Outline water use restrictions for drought periods in Operation and Maintenance Agreements.

These requirements only apply to new and expanding systems, however. ICC 13.03A mandates minimum design requirements for public water systems (CWSP, Appendix G), including installation of source meters. ICC 8.09 requires the installation of source flow meters at the well head for each new potable water source, including individual and public water supply systems. The Salt Water Intrusion Policy recommends that water conservation practices be incorporated into the operation and maintenance agreement in medium and high risk seawater intrusion areas. These recommendations are remedial, however, rather than preventative.

In addition to source meters, ICC 8.09 requires all new



individual and public water systems to submit water quality analyses, including bacteriological, nitrate, chloride, and any other parameters deemed necessary. The ground water requirements outlined in ICC 8.09 are consistent with the overall GWMP effort of obtaining potential monitoring wells, and data on water use and quality.

#### b. Well Identification and Abandonment

Improperly abandoned wells provide an avenue for ground water contamination. The number of abandoned wells presently existing in Island County is unknown. Well abandonment procedures are outlined in WAC 173-160, but may not be followed in all cases due to lack of awareness of the regulations.

A unique well numbering scheme and a current well inventory does not exist in Island County. Ecology has formed a Well Identification Task Force which is currently developing an options paper to evaluate possible implementation schemes. The Well Identification Program will enable tracking of wells and will help to ensure proper abandonment procedures, but release of the Task Force recommendations may not occur for some time. Implementation of Task Force recommendations will occur if recommendations are feasible and the problem is deemed significant enough to warrant the effort.

#### c. Water Rights

Authority for issuance of water rights has, by State law, been vested with Ecology. However, water rights provisions are not adequately implemented. This can be attributed, in most cases, to a) a lack of adequate staff and resources, and b) a deficiency of supporting data on safe sustainable yield and existing uses.

At the State level, there is a lack of a standard policy for evaluating withdrawal proposals. Although State law (RCW 90.44) specifically states that "no withdrawal of public groundwaters beyond the capacity of the underground bed or basin to yield such water within a reasonable or feasible pumping lift" will be granted a water rights permit, a set of applicable criteria is not provided.

Over-appropriation of water rights may have occurred in several areas in the County (CWSP, Appendix K). If these estimates are correct, and water rights are fully exercised, water will be removed from the groundwater system at a rate far greater than that of estimated replenishment.

The CWSP identifies the following problems with the water

rights issuance process:

- o Certificates of water rights are often issued for amounts greater than the actual needs;
- o Water rights are often unused or those abandoned have never been relinquished so the right is still technically an active appropriation;
- o Originally developed capacities have diminished due to system deficiencies or source deterioration;
- o Applications for new permits have been filed instead of changing the existing water right.

In addition, geographic service areas associated with water rights are not always changed to reflect actual service areas. In Island County, problems have arisen when relying on a water right permit for evaluating withdrawal proposals. Without criteria for evaluation, water rights may be issued in areas currently over appropriated. This is especially prevalent in areas that have received past subdivision approval but have not fully developed. However, Ecology has the authority to reduce water rights allocation where water rights are not being fully used. Presently, standard pumping test and monitoring regulations are in place for evaluations in the County.

#### SUMMARY

In summary, the Island County "sole source" aquifer is a critically important water supply. As a result of population growth in the region, ground water demand is expected to rise sharply in the future. If seawater intrusion and the various potential ground water quantity and quality problems are to be avoided, usage of the existing ground water resources must be carefully managed, and conservation programs that employ effective demand reduction techniques must be established. The recommended ground water management program is designed to focus on the problems identified. The primary goal of this program is to provide a viable and realistic approach to manage and protect ground water supplies for existing and future uses.

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## SECTION IV

### GOALS AND OBJECTIVES

#### A. PROGRAM PHILOSOPHY

The Island County Ground Water Advisory Committee, in its approach to the development of a Ground Water Management Program, recognizes the finite nature of Island County's groundwater resource and the increasing pressure, through growing population, on this resource.

The philosophy of the Ground Water Advisory Committee is consistent with Comprehensive Plan policy of living within the capacity of the natural resources of the County.

The Comprehensive Plan recommends that Island County should:

- o "Encourage managed and balanced utilization of all natural resources" (page II-10),
- o "Protect, maintain and enhance the quality and quantity of Island County's water resources for recreation, fish, wildlife, and domestic utilization" (II-15),

More specific policy elements of the Comprehensive Plan state that:

- o "Environmental and land use policies should be consistent with the need for proper water resource management" (II-15),
- o "The capability of air, land, and water resources to support development should be a determining factor in making land use decisions" (II-5),
- o "The location and design of urban development should be carefully guided in order to minimize potential adverse impacts on the quality of ground and surface waters." (II-6), and,
- o "Areas with limited ground water quality or quantity should be restricted to low density unless adequate domestic supplies are available" (II-6).

These policy elements comprise a framework upon which the policies of the Ground Water Management Program can be constructed.

## B. PROGRAM GOAL

The goal of the Island County Ground Water Management Program is to protect and enhance the quality, quantity, and recharge of ground water supplies in Island County.

## C. PROGRAM OBJECTIVES

The following objectives are necessarily broad in scope. Specific policy elements to be implemented as part of the GWMP can be identified only after sufficient research and evaluation of management options has taken place, and no attempt to present these specific options is made in this section.

Preventative management of ground water is ultimately more effective and efficient than restorative or remedial measures. The objectives of the Island County GWMP are generally oriented towards prevention of ground water problems; however, it is recognized that current and future problems will require remediation.

Objectives of the Island County GWMP are:

### EDUCATION

- o Educate the public and ground water managers about the characteristics of ground water resources and about confirmed and potential impacts on the resource.

### CONSERVATION

- o Establish a water use efficiency program, coordinated with the Island County Coordinated Water System Plan and the Comprehensive Plan, to help:
  - A. reduce existing usage,
  - B. maintain current ground water levels,
  - C. alleviate salt water intrusion problems,
  - D. ensure sustained supplies of ground water are available for Island County residents, and
  - E. optimize the efficiency of future ground water usage.

### MONITORING

- o Through data collection and analysis programs, increase knowledge of the limitations and characteristics of the County's groundwater resource. To provide useful information, such programs must recognize regional, seasonal, tidal, and other variables which affect ground

water characteristics throughout the County. An ongoing ground water monitoring program will help to:

- A. determine the extent of any seasonal and long-term trends in salt water intrusion;
  - B. determine the extent of any seasonal and long-term trends in water level changes;
  - C. refine estimates of rainfall, runoff, and recharge;
  - D. refine County-wide ground water usage estimates; and
  - E. identify any areas in which agricultural activities, domestic activities, hazardous waste disposal, chemical use, industrial/commercial activities, landfills or other land uses which have or may caused groundwater contamination.
- o Maximize the accumulation and use of information from new and existing wells.

#### REGULATION

- o Develop land use approval criteria based on ground water quantity, quality, recharge, the vulnerability of the resource, and risks associated with proposed land uses.
- o Prevent contamination of ground water through control of potentially contaminating activities or land uses.
- o Evaluate the effectiveness of existing County codes in protecting ground water and recommend changes, or the creation of new codes, where appropriate.
- o Explore other regulatory avenues in ground water protection which are reasonable and effective.

#### COORDINATION

- o Define the responsibilities and capabilities of all local, state, and federal agencies in the long-term management of groundwater in Island County.
- o Ensure that planning efforts in the County which may impact ground water are coordinated with the Ground Water Management Program.
- o Ensure that Island County ground water issues are considered in State efforts to develop new water resource policies and regulations.

#### D. ISLAND COUNTY GROUND WATER POLICY

It shall be the policy of Island County that all proposed actions be consistent with the goals and objectives of the Ground Water Management Program. The following statements will implement elements of the these goals and objectives, and the recommendations of the Ground Water Advisory Committee.

Water Rights: Any action which involves or leads to a change in ground water usage, including distribution, should be accompanied by appropriate changes to water rights. These actions include, but are not limited to, water system expansion, annexations by water districts or municipalities, and water system planning. Water rights no longer in use may be relinquished under the authority of Ecology.

Water Use Efficiency: Inefficient use of Island County water resources shall be inconsistent with this policy. Any proposed actions leading to or involving uses of Island County water resources should be evaluated in terms of water use efficiency, and approval withheld until a finding is made that reasonable efforts have been made and appropriate technologies used to ensure that water use practices will be consistent with the goals of the Ground Water Management Program.

Ground Water Recharge: Recharge of ground water is the preferred method of surface water disposal from a site, except where such recharge could contaminate ground water or otherwise cause adverse environmental impacts, such as depletion of downstream flows. Any action which involves the creation of impervious surfaces should be carefully evaluated in terms of the effect on recharge. Where appropriate and as necessary, total impervious surface should be limited to protect recharge.

Contamination of Ground Water: Any proposed action should be evaluated in terms of potential for ground water contamination, and approval withheld until a finding is made that appropriate measures have been taken to avoid such contamination. Such contamination shall include, but not be limited to, seawater intrusion and the introduction of harmful chemicals or other substances, by any means, into the ground water.



Because of the serious environmental and public health implications which would result from risking the only available drinking water to eighty percent of the County's population and the difficulty and cost of ground water remediation associated with even small chemical spills, throughput oil transmission facilities in Island County, including pipelines, should not be permitted.

Existing policies and regulations, such as SEPA, should be used as appropriate to address contamination concerns. Any remedial measures resulting from past actions should be consistent with the GWMP.

Well Abandonment: Any action leading to or involving the abandonment or discontinued use of any water well should not be approved until assurances are made that all such abandoned wells will be located and identified and that such abandonment will follow appropriate procedures as provided for in State law.

Well Identification: Any proposed action which involves the preparation or exchange of information on real properties should not be granted final approval until the location and status (active or abandoned) of any wells, along with status of any water rights associated with such wells, are properly identified and documented.

Ground Water Withdrawals: Any proposed action which involves or leads to withdrawals of ground water should not be granted final approval until reasonable assurances are made that such withdrawals will not adversely impact existing ground water uses.

Watershed Protection: Island County should work closely with municipalities and large water systems to provide comprehensive protection of the water resources serving these systems, especially where such protection is needed on lands outside the jurisdiction of these systems. This should include joint protection of watersheds, wellhead protection, and other efforts where cooperative action would most effectively provide the necessary protection.

Coordination with State Agencies: State and federal agencies, including the Department of Ecology, the Department of Health, the Department of Natural Resources, the

Department of Fisheries, the Federal Emergency Management Agency, and other applicable agencies, when exercising their authority in Island County, should make every effort to ensure that the policies of the Ground Water Management Program are not contradicted. Furthermore, these affected jurisdictions should review their applicable policies and regulations and consider amendments, as appropriate, to ensure consistency with the goals and objectives of the GWMP.